

Anesthetic Management of Patient with Severe Interstitial Pulmonary Fibrosis Undergoing Laparoscopic Cholecystectomy (Case Report)

Sabry M Amin*

Department of Anaesthesiology, Faculty of Medicine, Tanta University, Egypt

*Corresponding author: Sabry M Amin, Department of Anaesthesiology, Faculty of Medicine, Tanta University, Egypt, Tel: 00201221793439; E-mail: sabry_amin@yahoo.com

Received Date: February 12, 2016; Accepted Date: May 11, 2016; Published Date: May 16, 2016

Copyright: © 2016 Amin SM. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

We report the anesthetic management of a patient with severe pulmonary fibrosis for laparoscopic cholecystectomy using an i-gel. A 59-yr-old, 75 kg female was undergoing elective laparoscopic cholecystectomy for acute cholecystitis. The patient had severe pulmonary fibrosis requiring oxygen therapy at home. I-gel has proved to be effective in a patient with severe pulmonary fibrosis who underwent laparoscopic cholecystectomy.

Keywords: Idiopathic pulmonary fibrosis; Anesthesia; I-gel; Laparoscopic cholecystectomy

Introduction

Idiopathic interstitial pulmonary fibrosis (IPF) is considered the most common form of interstitial lung disease (ILD). Its course is a progressive of and its cause is unknown. Idiopathic interstitial pulmonary fibrosis affect the gas exchange as it results in chronic inflammation and progressive fibrosis of lung parenchyma. The signs and symptoms of this disease consist of progressive dyspnea, hypoxia, clubbing and crepitations at the lung bases [1].

IPF is a fatal lung disease; the natural history is variable and unpredictable: Most patients with IPF demonstrate a gradual worsening of lung function over years; a minority of patients remains stable or declines rapidly. Some patients may experience episodes of acute respiratory worsening despite previous stability.

The ATS/ERS/JRS/ALAT 2011 Revised Diagnostic Criteria

The diagnosis of IPF is based on the absence of a known cause of lung fibrosis, computed tomography (CT) findings and, in cases with CT abnormalities that are not classical for IPF, the use of pathological criteria [2].

An Official ATS/ERS/JRS/ALAT Statement

IPF is defined as a specific form of chronic, progressive fibrosing interstitial pneumonia of unknown cause, occurring primarily in older adults, limited to the lungs, and associated with the histopathologic and/or radiologic pattern of unspecified interstitial pneumonia (UIP) [3].

The Diagnosis of IPF Requires

- 1. Exclusion of other known causes of interstitial lung disease (ILD) The presence of a unspecified interstitial pneumonia (UIP) pattern on high-resolution computed tomography (HRCT) in patients not subjected to surgical lung biopsy.

- 2. Specific combinations of HRCT and surgical lung biopsy pattern in patients subjected to surgical lung biopsy.

The accuracy of the diagnosis of IPF increases with multidisciplinary discussion between pulmonologists, radiologists, and pathologists experienced in the diagnosis of ILD.

We report 59-yr-old, female with severe Idiopathic pulmonary fibrosis (IPF) undergoing laparoscopic cholecystectomy because of acute inflammation of gall bladder.

Preoperative Preparation

The patient underwent preoperative assessment by history taking, Physical examination and preoperative laboratory investigations which include (complete blood count, liver function, blood urea and creatinine, fasting and postprandial blood sugar, prothrombin time and activity and arterial blood gas, ECG, and echocardiography).

The medical history of the patients revealed that, the patients had controlled hypertension and diabetes mellitus which controlled by insulin.

The laboratory investigations revealed the following: leukocytosis WBC 18000/ML, PO₂ 60 mmHg and O₂ saturation 90% on air, otherwise no abnormalities were found. Pulmonary function test was done and revealed severe restrictive pattern of pulmonary function as FEV1/VC 115%. The chest X-ray (Figure 1) showed bilateral lung infiltration and loss of lung volume.



Figure 1: The chest X-ray (antero-posterior) showed bilateral lung infiltration and loss of lung volume.

Premedication

We optimize the chest condition by bronchodilator, antibiotic, nebulization and corticosteroids 3 days before surgery.

The patient received 150 mg ranitidine and 10 mg of metoclopramide one hour before anesthesia.

Intraoperative management

On arrival to operating room an intravenous line was inserted. Patient was attached to monitor displaying ECG, HR, NIBP, ETCO₂ and O₂ saturation.

The patient received preoxygenation for 3 min before anesthesia, anesthesia was induced by fentanyl 2 ug/kg, propofol 2 mg/kg and cisatracurium 0.15 mg/kg, assisted ventilation was done for 3 min, the size 4 i-gel was inserted after lubricating the device with a water-based lubricant according to manufacturer's recommendations [4].

After insertion of the of the i-gel it was fixed by adhesive tape and we confirm the adequacy of ventilation by observing the raise of chest wall, chest auscultation, and presence of square wave of capnogram. 12F gastric tube was inserted through gastric channel for gastric decompression and the gastric tube was connected to collection bag to drain freely during surgery.

Anesthesia was maintained with isoflurane in oxygen. The ventilator was adjusted to achieve SpO₂ ≥95% and end-tidal CO₂ of 32-35 mmHg through tidal volumes of 6 ml/kg, respiratory rate of 10-14/min and I:E ratio 1:1.5.

The intra-abdominal pressure was set at 12 mmHg for creation pneumoperitoneum to allow visualization of intraabdominal organs.

One hour after start of surgery, the O₂ saturation was decreased from 99% to 92%, and in an trial to overcome this event we changed the ventilator parameters as follow: inspiratory: expiratory ratio was changed to 1:1, increase the tidal volumes to 8 ml/kg after these modification of ventilator parameters, the O₂ saturation was increased to 98% and maintained till the end of operation.

After completion of surgery, residual neuromuscular block was antagonized with atropine 0.02 mg/kg and neostigmine 0.05 mg/kg. The i-gel airway device was removed once patient had spontaneous breathing, return of airway reflexes, spontaneous or on command eye opening and purposeful movement. The patient was transferred to the intensive care unit with no pain, no nausea or vomiting and O₂ saturation was 90% on room air increased to 98% on low flow O₂ 2 L/min by nasal cannula.

Discussion

General anesthesia with endotracheal tube remains the best choice for laparoscopic cholecystectomy to protect the patients against pulmonary aspiration and respiratory distress as a result of increased intra-abdominal pressure during pneumoperitoneum [5].

Our findings suggest that the i-gel was a useful airway device alternative to tracheal intubation and PLMA for laparoscopic cholecystectomy in patient with severe interstitial pulmonary fibrosis.

The lung protective strategy was used in patients with pulmonary fibrosis, which include limit the inspiratory pressure to not more than 30 mmHg, limit the tidal volume to not more than 8 ml/kg to avoid barotrauma and volutrauma [6,7].

The i-gel was used in this case because of the following: No inflatable cuff which allow ease of insertion, decrease the risk of tissue damage, less post-operative sore throat, and no position change after insertion [8,9].

I-gel is beneficial because it reduces airway stimulation, decrease the risk for bronchospasm, protects against pulmonary aspiration because It provides better seal and the possibility insertion of gastric tube allows gastric drainage provide additional safety against regurgitation and aspiration.

Also, the i-gel is a single-use disposable device that reduces the risk of transfer of infectious material or body fluids compared with improperly cleaned reusable devices.

The disadvantages of supraglottic devices with inflatable cuff include, tissue distortion, venous compression, nerve injury, and increased incidence of postoperative morbidity [8].

The causes of postoperative morbidity of supraglottic devices with inflatable cuff include, Trauma during insertion, multiple attempts, pressure exerted by cuff against the pharyngeal mucosa, cuff volumes and cuff pressure (10-13).

Advantages of the i-gel over the PLMA include, better anatomic fit was achieved when compared to PLMA [14,15] faster and easy insertion with a low incidence of postoperative sore throat [16].

Advantages of the i-gel over the tracheal tube included: ease of placement; hemodynamic stability at induction and during recovery which benefit to patients with cardiovascular and respiratory disease; reduced anesthetic requirements; lower frequency of coughing during emergence; and lower incidence of pharyngolaryngeal morbidity. Also it results in smooth recovery from anaesthesia and less postoperative nausea, vomiting, airway morbidity, and analgesic requirements than the tracheal tube.

The incidence of postoperative sore throat after was less after supraglottic devices when compared to tracheal intubation which ranged from 30-70% after tracheal intubation so, supraglottic devices associated with more patients comfort and satisfaction.

Disadvantages of supraglottic devices were lower seal pressures and gastric insufflation.

The incidence of gastric distention and pulmonary aspiration during laparoscopic surgery may be increased because of increased intraabdominal pressure as result of pneumoperitoneum, head down position, peritoneal stimulation, and increase gastro-esophageal reflux.

My opinion about the incidence of gastric distention and pulmonary aspiration during laparoscopic surgery under general anesthesia with i-gel we believed that it is not increased when the i-gel was used as rescue airway which can be explained by: the i-gel is truly anatomical device. The soft non inflatable cuff fits snugly on to the per laryngeal frame work, mirroring the shape of the epiglottis, aryepiglottic folds, piriform fossae, perithyroid, pericricoid, posterior cartilages and spaces. The seal created is sufficient for both spontaneously breathing patients and for intermittent positive pressure ventilation. It provides a better seal for positive pressure ventilation, separation of the respiratory from the alimentary tract and the venting of gas or liquid via its unique drain port. The drain port allows placement of gastric tube for decompression of stomach during surgery [8].

The supraglottic devices were proved to be effective ventilator device in patients underwent laparoscopic surgery as follow:

The reported incidence of aspiration or more serious morbidity associated with the use of the LMA in laparoscopic surgery is very low which support our finding [17].

Moreover, Supreme laryngeal mask airway was proved to be a suitable alternative to intubation in laparoscopic surgical procedures [18].

Additionally Supreme laryngeal mask airway was used as airway device for laparoscopic cholecystectomy in patient with severe pulmonary fibrosis [19].

Also there was no evidence to suggest that the use of intermittent positive pressure ventilation via the laryngeal mask increases the risk of gastro-oesophageal reflux in patients undergoing gynaecological laparoscopy [20,21].

Both classic LMA and prosel LMA were used as airway management in patients undergoing laparoscopic cholecystectomy and both devices were suitable but The PLMA is a more effective airway device for laparoscopic cholecystectomy than the LMA [22].

Also there were no statistically significant differences in oxygen saturation or end tidal CO₂ between the prosel LMA and tracheal intubation before or during pneumoperitoneum. With no gastric distension during surgery with prosel LMA in patients underwent laparoscopic cholecystectomy [23].

Conclusion

The i-gel is useful supraglottic device and can replace the need of tracheal intubation in elective laparoscopic cholecystectomy in patient with severe interstitial pulmonary fibrosis with no reported serious complications and low incidences of pharyngolaryngeal morbidity.

Conflict of Interest Disclosure

The authors have no conflict of interest.

References

1. Mallick S (2008) Outcome of patients with idiopathic pulmonary fibrosis (IPF) ventilated in intensive care unit. *Respir Med* 102: 1355-1359.
2. Wells AU (2013) The revised ATS/ERS/JRS/ALAT diagnostic criteria for idiopathic pulmonary fibrosis (IPF)--practical implications. *Respir Res* 14 Suppl 1: S2.
3. Raghu G, Collard HR, Egan JJ, Martinez FJ, Behr J, et al. (2011) An official ATS/ERS/JRS/ALAT statement: idiopathic pulmonary fibrosis: evidence-based guidelines for diagnosis and management. *Am J Respir Crit Care Med* 183: 788-824.
4. I-gel User Guide. 7th edn. Wokingham, UK: Intersurgical Ltd.
5. Nava S, Rubini F (1999) Lung and chest wall mechanics in ventilated patients with end stage idiopathic pulmonary fibrosis. *Thorax* 54: 390-395.
6. Mollica C, Paone G, Conti V, Ceccarelli D, Schmid G, et al. (2010) Mechanical ventilation in patients with end-stage idiopathic pulmonary fibrosis. *Respiration* 79: 209-215.
7. Hoegl S, Boost KA, Flondor M, Scheiermann P, Muhl H, et al. (2008) Short-term exposure to high-pressure ventilation leads to pulmonary biotrauma and systemic inflammation in the rat. *Int J Mol Med* 21: 513-519.
8. Levitan RM, Kinkle WC (2005) Initial anatomic investigations of the I-gel airway: a novel supraglottic airway without inflatable cuff. *Anaesthesia* 60: 1022-1026.
9. Brain AI, Verghese C, Strube PJ (2000) The LMA 'ProSeal'--a laryngeal mask with an oesophageal vent. *Br J Anaesth* 84: 650-654.
10. Grady DM, McHardy F, Wong J, Jin F, Tong D, et al. (2001) Pharyngolaryngeal morbidity with the laryngeal mask airway in spontaneously breathing patients: does size matter? *Anesthesiology* 94: 760-766.
11. Gatward JJ, Cook TM, Sellar C, Handel J, Simpson T, et al. (2008) Evaluation of the size 4 i-gel airway in one hundred non-paralysed patients. *Anaesthesia* 63: 1124-1130.
12. Brimacombe J, Holyoake L, Keller C, Brimacombe N, Scully M, et al. (2000) Pharyngolaryngeal, neck, and jaw discomfort after anesthesia with the face mask and laryngeal mask airway at high and low cuff volumes in males and female. *Anesthesiology* 93: 26-31.
13. Burgard G, Möllhoff T, Prien T (1996) The effect of laryngeal mask cuff pressure on postoperative sore throat incidence. *J Clin Anesth* 8: 198-201.
14. Brimacombe J, Keller C (2000) The ProSeal laryngeal mask airway. A randomized, crossover study with the standard laryngeal mask airway in paralyzed, anaesthetized patients. *Anesthesiology* 93: 104-109.
15. Brimacombe J, Keller C, Fullekrug B, Agrò F, Rosenblatt W, et al. (2002) A multicenter study comparing the ProSeal and Classic laryngeal mask airway in anesthetized, nonparalyzed patients. *Anesthesiology* 96: 289-295.
16. Chauhan G, Nayar P, Seth A, Gupta K, Panwar M, et al. (2013) Comparison of clinical performance of the I-gel with LMA prosel. *J Anaesthesiol Clin Pharmacol* 29: 56-60.
17. Viira D, Myles PS (2004) The use of the laryngeal mask in gynaecological laparoscopy. *Anaesth Intensive Care* 32: 560-563.
18. Aydogmus MT, Turk HS, Oba S, Unsal O, Sinikoglu SN (2014) Can Supreme[®] laryngeal mask airway be an alternative to endotracheal intubation in laparoscopic surgery? *Braz J Anesthesiol* 64: 66-70.
19. Carron M, Marchet A, Ori C (2009) Supreme laryngeal mask airway for laparoscopic cholecystectomy in patient with severe pulmonary fibrosis. *Br J Anaesth* 103: 778-779.
20. Ho BY, Skinner HJ, Mahajan RP (1998) Gastro-oesophageal reflux during day case gynaecological laparoscopy under positive pressure ventilation: laryngeal mask vs. tracheal intubation. *Anaesthesia* 53: 921-924.
21. Skinner HJ, Ho BY, Mahajan RP (1998) Gastro-oesophageal reflux with the laryngeal mask during day-case gynaecological laparoscopy. *Br J Anaesth* 80: 675-676.
22. Lu PP, Brimacombe J, Yang C, Shyr M (2002) ProSeal versus the Classic laryngeal mask airway for positive pressure ventilation during laparoscopic cholecystectomy. *Br J Anaesth* 88: 824-827.
23. Maltby JR, Beriault MT, Watson NC, Liepert D, Fick GH (2002) The LMA ProSeal is an effective alternative to tracheal intubation for laparoscopic cholecystectomy. *Canadian Journal of Anesthesia* 49: 857-862.